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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/066,920 | 02/04/2002 | Takenori Sekijima | P/1071-1539 | 4354 |

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| EXAMINER |
|---|
| SONG, MATTHEW J |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1765 | |

DATE MAILED: 03/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/066,920 | SEKIJIMA ET AL. | |
| | Examiner | Art Unit | |
| | Matthew J Song | 1765 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *10 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-4,8-10,16 and 17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4, 8-10, 16 and 17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/17/2004 has been entered.

### *Claim Rejections - 35 USC § 103*

2. Claims 1, 2, 3, 8, 9 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekijima et al (US 6,039,802) or Kimura et al (US 4,256,531) in view of Baghadi et al (US 4,196,041).

Sekijima et al discloses a single crystal growth method, which allows single crystal to be grown stable while controlling its growth orientation. The method comprises the steps of holding a polycrystalline rod and seed crystal within a heating furnace; heating the polycrystalline rod to form a melt zone and growing a single crystal by moving a melt zone (Abstract and Figs 1-5). Sekijima et al also discloses the polycrystalline rod may be a thin crystal having a fibrous shape of less than 3 mm in diameter (col 4, ln 15-25). Sekijima et al also discloses the single crystal growth method is self-solvent floating zone and the polycrystal is YIG or an oxide superconductor such as YBCO (col 3, ln 25-67). Sekijima et al also discloses the density of the raw material may be increased and a good quality crystal can be grown with a high yield (col 2, ln 50-67).

Kimura et al discloses a method of producing a single crystal of yttrium-iron garnet by a floating zone method (Abstract). Kimura et al also teaches the shape of the molded mixture can be any rod type as it is used in the floating zone method and a cylindrical rod having a diameter of 1 mm to 10 cm is preferable (col 4, ln 10-20). Kimura et al also discloses a molded mixture of $R_3M_5O_{12}$, where R represents Y and optionally other rare earth elements (col 4, ln 55-65 and col 2, ln 10-40). Also, Kimura et al teaches the size of the rod and single crystal product has approximately the same size (col 7, ln 1-35).

Sekijima et al or Kimura et al does not teach manufacturing a single crystal without using any seed crystal.

In a method of converting a polycrystalline sheet into a monocrystalline sheet, note entire reference, Baghdadi et al teaches a method of forming a monocrystalline material from a polycrystalline material without requiring the use of a seed crystal. Baghdadi et al teaches the formation of a region of a sheet having a small width compared to the width of the remainder of the sheet and a molten zone is formed in the small width region of the sheet, which is allowed to solidify into a single crystal (Abstract and col 1, ln 20-35). Baghdadi et al also teaches the method is low in cost and a high volume process (col 1, ln 35-50 and col 4, ln 35-40). Baghdadi et al also teaches other semiconductor materials and compound semiconductor materials and the like may be employed (col 2, ln 30-40). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Sekijima et al or Kimura et al with Baghdadi et al's method of forming a single crystal using a molten zone method, which does not require a seed crystal, because the process is inexpensive and capable of high volume (col 1, ln 35-45) and the cost of the seed crystal is eliminated, which is desirable.

The combination of Sekijima et al and Baghdadi et al or the combination of Kimura et al and Baghadi et al is silent to the crystal grows in the direction normal to the densest surface. However, this is inherent to the combination of Sekijima et al and Baghdadi et al or the combination of Kimura et al and Baghadi et al because the combination of Sekijima et al and Baghdadi et al or the combination of Kimura et al and Baghadi et al teaches a similar method of float zone growth. Also the molten zone is inherently less dense than a growing single crystal therefore the growth inherently occurs in a direction normal the growing single crystal, the densest surface.

Referring to claim 8, Baghadi et al teaches a method of forming a single crystal without using a seed crystal.

3. Claim 4 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekijima et al (US 6,039,802) or Kimura et al (US 4,256,531) in view of Baghadi et al (US 4, 196,041) as applied to claims 1-3, 8-9 and 16-17 above, and further in view of Cordova-Plaza et al (US 5,082,349) or Kobayashi et al (US 4,323,418).

The combination of Sekijima et al and Baghadi et al or the combination of Kimura et al and Baghadi et al teaches all of the limitations of claim 4, as discussed previously, except that step (b) is performed using the Laser Heated Pedestal Growth Method.

In a method of manufacturing single crystals, Cordova-Plaza et al teaches single crystal fibers have been manufactured using the laser heated pedestal growth method, a variant of the float zone process. And in such a method, the upper end of a source rod of crystal material is heated with a focused laser beam (col 2, ln 1-67). It would have been obvious to a person of

ordinary skill in the art at the time of the invention to modify the combination of Sekijima et al and Baghadi et al or the combination of Kimura et al and Baghadi et al with Cordova-Plaza et al's laser heated pedestal growth method utilizing a laser beam to form a molten zone because heating with a laser beam to form a molten zone is well known variant to the float zone method of crystal growth.

In a method of growing single crystals, note entire reference, Kobayashi et al teaches a floating zone technique, where a feed rod is heated into a molten zone by radio frequency heating or laser heating, this reads on applicant's laser heated pedestal growth method, and the molten zone is transferred, thereby turning the feed rod into a single crystal (col 1, ln 10-55). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Sekijima et al and Baghadi et al or the combination of Kimura et al and Baghadi et al's heating with Kobayashi's laser heating because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

***Response to Arguments***

4. Applicant's arguments filed 11/17/2004 have been fully considered but they are not persuasive.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5

USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Baghdadi et al teaches a process which allows the conversion of polycrystalline material to a monocrystalline material without the use of a seed crystal (col 4, ln 25-35 and col 1, ln 20-32). Applicants admit that the use of a seed crystal involves an added cost (pg 5 of the remarks filed 11/17/2004); therefore a person of ordinary skill in the art at the time of the invention would have been motivated to use Baghadi et al's process of forming a monocrystal material from a polycrystalline material without using a seed to reduce costs.

In response to applicant's argument that nothing in the references would lead one skilled in the art to expect the results to be different if form and dimensions were controlled (pg 7), the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Sekijima et al and Kimura et al both suggest using a polycrystalline rod and forming a single crystalline rod which is 3 mm or less in diameter ('802 col 4, ln 15-21 and '531 col 4, ln 13-18). Therefore, applying the method of controlling a molten zone to form a single crystal without using a seed crystal, as taught by Baghadi et al; the advantages alleged by applicant would have naturally flowed from the suggestion of the prior art.

## *Conclusion*

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Asahi e al (US 5,871,580) teaches vertical Bridgman and vertical gradient freeze method of single crystal growth does not require a seed crystal (col 1, ln 10-30).

Wysocki et al (US 5,069,743) teaches a method of making a single crystal without using a seed crystal in floating zone method (col 5, ln 15-20 and Abstract).

Kimata et al (JP 05-025148) teaches an organic single crystal forming using the Bridgman-Stockburger method to form a crystal of 3 mm in diameter (Abstract).

Okazaki et al (US 4,981,613) teaches single crystals formed by the Bridgman method having a diameter of 2 micrometers (col 15, ln 35-50).

Hagi et al (US 6,402,838) teaches a method of crystal growth not requiring a seed crystal, which suppresses costs (col 4, ln 15-40).

Izumi et al (US 6,210,477) teaches since a cheaper seed crystal can be used, the cost of pulling a single crystal can be reduced (col 6, ln 20-35), which is a teaching that seed crystals affect production costs.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS
March 11, 2005

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER